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CLAIMS

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[Claim(s)]

[Claim 1] general formula  $A_xMyTi_{2-y}O_4$  (however, A -- K, Rb, or Cs.) M  $Mg^{2+}$ ,  $Ni^{2+}$ ,  $Zn^{2+}$ ,  $Cu^{2+}$ ,  $Fe^{3+}$ ,  $Al^{3+}$ ,  $Ga^{3+}$ , or  $Mn^{3+}$  is expressed, x -- 0.5-1.0y -- the range of 0.25-1.0 -- it is -- by processing A ion configurated between layers with an acid aqueous solution, and making it exchange for  $H^+$  or  $H_3O^+$  ion about a stratified plate crystal of a shown ortho rhombic system.

General formula  $H_xMyTi_{2-y}O_4$  and  $nH_2O$ . however, M --  $Mg^{2+}$ ,  $Ni^{2+}$ , and  $Zn^{2+}$ .  $Cu^{2+}$ ,  $Fe^{3+}$ ,  $Al^{3+}$ ,  $Ga^{3+}$ , or  $Mn^{3+}$  is expressed, and ranges of x of 0.5-1.0y are 0.25-1.0 -- n -- two or less -- it is -- a manufacturing method of a stratified titanic acid plate crystal of a shown ortho rhombic system.

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[Translation done.]

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention — general formula  $A_xMyTi_2-yO_4$  (however, A — K.) Rb, or Cs and M express  $Mg^{2+}$ ,  $Ni^{2+}$ ,  $Zn^{2+}$ ,  $Cu^{2+}$ ,  $Fe^{3+}$ ,  $Al^{3+}$ ,  $Ga^{3+}$ , or  $Mn^{3+}$ , and the ranges of x of 0.5–1.0y are 0.25–1.0. the following — it is the same — from the plate crystal which has the layer structure of the ortho rhombic system shown, with the layer structure of an ortho rhombic system held, General formula  $H_xMyTi_2-yO_4$  and  $nH_2O$ . however, M —  $Mg^{2+}$ ,  $Ni^{2+}$ , and  $Zn^{2+}$ . the following express  $Cu^{2+}$ ,  $Fe^{3+}$ ,  $Al^{3+}$ ,  $Ga^{3+}$ , or  $Mn^{3+}$ , and the ranges of x of whose 0.5–1.0y are 0.25–1.0 and whose n is two or less — it is the same — it is related with the manufacturing method of the plate crystal of the titanitic acid shown. This plate crystal is useful as a cation exchanger, a filter, a proton conductor, and a catalyst.

[0002]

[Description of the Prior Art] Usually, if it is called titanitic acid,  $TiO_2$  and  $nH_2O$  will show and it will be an amorphous gel substance. This is known as unique inorganic ion adsorption material, and is widely used for the recovered material of uranium in sea water, etc. However, since it is not a crystalline, control of the selectivity of metal ion is difficult.

[0003] The purpose of this invention is to provide the manufacturing method of the titanitic acid of the plate crystal which has the ortho rhombic system layer structure shown by general formula  $H_xMyTi_2-yO_4$  and  $nH_2O$ .

[0004]

[Means for solving problem] The plate crystal titanitic acid obtained by this invention has the presentation shown by general formula  $H_xMyTi_2-yO_4$  and  $nH_2O$ , and is the layer structure.  $TiO_6$  octahedron chains by \*\*\*\*\* side share, and forms the layer structure. since M metal ion has replaced a part of the Ti seat, H ion or  $H_3O^+$  ion can configurate stably between layers for adjustment of positive charge.

[0005] In primary, although this kind of titanitic acid is uncompoundable, the plate crystal of the ortho rhombic system layer structure shown by general formula  $A_xMyTi_2-yO_4$  as a primary phase is compounded, By carrying out acid treatment of this in 2nd order, and exchanging A ion for  $H^+$  ion or  $H_3O^+$  ion, it studied that the titanitic acid of the plate crystal which has the layer structure of the ortho rhombic system shown by  $H_xMyTi_2-yO_4$  and  $nH_2O$  was manufactured. It is a substance which can be manufactured only in this process.

[0006] As an acid aqueous solution which extracts A ion by acid treatment, although what kind of acid aqueous solution may be sufficient, a hydrochloric acid aqueous solution is the most effective. Although the concentration and processing time of acid serve as important conditions, this also influences the crystallinity of the compound crystal greatly and can be suitably decided with careful attention to that such same concentration that crystallinity is high takes a long time and processing time being greatly influenced also with the temperature of an acid aqueous solution.

[0007] What is necessary is just to compound by suitable methods, such as flux growth, as a method of compounding the plate crystal of the ortho rhombic system layer structure shown by general formula  $A_xMyTi_2-yO_4$  as a primary substance.

[0008]Next, the embodiment of this invention is shown.

[0009]

[Working example]First, the plate crystal shown by  $K_xMgyTi_{2-y}O_4$  ( $x=0.8$ ,  $y=0.4$ ) as a primary substance was compounded. This composition was performed with flux growth. ( $K_2O$ ) The flux raw material powder of the mole-ratio rate of  $(K_2O)_{1.0}(MoO_3)_{1.0}$  was mixed at a rate of the mole percentage of 30 to 70 in the end of the crystal precursor powder of the mole-ratio rate of  $0.5(MgO)_{0.5}(TiO_2)_{1.5}$ .

[0010]The platinum crucible was filled up with this mixture, melting was carried out at 1150 \*\* with the electric furnace, it cooled slowly at 4 \*\*/h in speed to 950 \*\* after that, and the crystal was raised. The crucible was taken out after annealing and it cooled radiationally in the atmosphere. The generated crystal immersed the whole crucible into boiling water, and dissolved and took out flux. The plate crystal which presents a rhombus (2-3 mm x 3-5 mm) was obtained. When this plate crystal was identified by X ray powder diffractometry, it was a right crystalline of the object.

[0011]This plate crystal was broken to about 0.5 mm, it was immersed into the HCl solution per [ 0.1N ] 2g. and 1 l., and extracting processing of 5 hour K ion was performed, agitating, and it was made to exchange for  $H^+$  ion. After the reaction was rinsed, was put into the container which prevents desiccation, and was made into the ion exchanger.

[0012]It will become anatase, if this sample is dried and it heat-treats at 500 \*\* for identification, Since all became rutile when calcinated at 1000 \*\*, all of K ion were replaced by  $H^+$  ion and it turned out that it is titanic acid of  $H_{0.8}Mg_{0.4}Ti_{1.6}O_4$  and a  $nH_2O$  presentation.

[0013]

[Effect of the Invention]Holding the layer structure of an ortho rhombic system from the plate crystal which has the layer structure of the ortho rhombic system shown by general formula  $AxMyTi_{2-y}O_4$  according to this invention, as explained above. The plate crystal of the titanic acid shown by general formula  $HxMyTi_{2-y}O_4$  and  $nH_2O$  can be manufactured. This plate crystal is useful as a cation exchanger, a filter, a proton conductor, and a catalyst.

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